Literaturverzeichnis

[1] H. London. *Separation of Isotopes*. George Newnes Limited, London (1961).

[2] P. T. Greenland. Laser isotope separation. *Contemp. Phys.* **31**(6), 405–424 (1990).

[3] W. H. King. *Isotope Shifts in Atomic Spectra*. Plenum, New York (1984).

[4] S. Rutz, R. de Vivie-Riedle, and E. Schreiber. Femtosecond wave-packet propagation in spin-orbit-coupled electronic states of $^{39,39}K_2$ and $^{39,41}K_2$. *Phys. Rev. A* **54**(1), 306–313 (1996).

[5] J. Heufelder, H. Ruppe, S. Rutz, E. Schreiber, L. Wöste. Fractional revivals of vibrational wave packets in the NaK $A^1\Sigma^+$ state. *Chem. Phys. Lett.* **269**, 1–8 (1997).

[6] I. S. Averbukh, M. J. J. Vrakking, D. M. Villeneuve, and A. Stolow. Wave Packet Isotope Separation. *Phys. Rev. Lett.* **77**(17), 3518–3521 (1996).

[7] W. D. Phillips, J. V. Prodan, and H. J. Metcalf. Laser cooling and electromagnetig trapping of neutral atoms. *J. Opt. Soc. Am. B* **2**, 1751–1767 (1985).

[8] E. L. Raab, M. Prentiss, A. Cable, S. Chu, and D. E. Pritchard. Trapping of Neutral Sodium Atoms with Radiation Pressure. *Phys. Rev. Lett.* **59**(23), 2631–2634 (1987).

[9] Z. Chang. Single attosecond pulse and xuv supercontinuum in the high-order harmonic plateau. *Phys. Rev. A* **70**(4), 43802 (2004).

[10] P. F. Moulton. Spectroscopic and laser characteristics of Ti:Al_2O_3. *J. Opt. Soc. Am. B* **3**(1), 125–133 (1985).

[11] C. Rullière. *Femtosecond Laser Pulses - Principles and Experiments*. Springer Verlag, Berlin, Heidelberg (1998).

[12] J. D. Kafka, M. L. Watts, and J.-W. Pieterse. Picosecond and Femtosecond Pulse Generation in a Regeneratively Mode-Locked Ti:Sapphire Laser. *IEEE J. Quant. Elect.* **28**(10), 2151–2162 (1992).

[13] A. Yariv and P. Yeh. *Optical Waves in Crystals: Propagation and Control of Laser Radiation*. Wiley-Interscience, New York (1983).

[14] Operator's Manual; The Coherent Mira Seed Laser. *Coherent Laser Group* (1997).

[15] J.-C. Diels and W. Rudolph. *Ultrashort Laser Pulse Phenomena*. Academic Press, San Diego (2006).

[16] D. Strickland and G. Mourou. Compression of Amplified Chirped Optical Pulses. *Opt. Commun.* **56**(3), 219–221 (1985).

[17] Operator's Manual; RegA Model 9000 Laser. *Coherent Laser Group* (1997).

[18] N. P. Barnes and B. M. Walsh. Amplified Spontaneous Emission - Application to Nd:YAG Lasers. *IEEE J. Quantum Electron* **35**(1), 101–109 (1999).

[19] H. Ruppe. *Wellenpaketdynamik in dissoziativen Systemen*. Diplomarbeit, Freie Universität Berlin, Berlin (1995).

[20] A. Bartelt. *Steuerung der Wellenpaketdynamik in kleinen Alkaliclustern mit optimierten Femtosekundenpulsen*. Dissertation, Freie Universität Berlin (2002).

[21] J.-K. Rhee, T. S. Sosnowski, A.-C. Tien, and T. B. Norris. Real-time dispersion analyzer of femtosecond laser pulses with use of a spectrally and temporally resolved upconversion technique. *J. Opt. Soc. Am. B* **13**(8), 1780–1785 (1996).

[22] J.-P. Foing, J.-P. Likforman, M. Joffre, and A. Migus. Femtosecond Pulse Phase Measurement by Spectrally Resolved Up-Conversion: Application to Continuum Compression. *IEEE J. Quant. Electr.* **28**(10), 2285–2290 (1992).

[23] M. R. Fettermann, J. C. Davis, H.-S. Tan, W. Yang, D. Goswami, J.-K. Rhee, and W. S. Warren. Fast-frequency-hopping modulation and detection demonstration. *J. Opt. Soc. Am. B* **18**(9), 1372–1376 (2001).

[24] S. Linden, H. Giessen, and J. Kuhl. XFROG - A New Method for Amplitude and Phase Characterization of Weak Ultrashort Pulses. *Phys. Stat. Sol. B* **206**(1), 119–124 (1998).

[25] J. I. Steinfeld. *Molecules and Radiation - An Introduction to Modern Molecular Spectroscopy*. Harper and Row, Publishers, Inc., New York (1974).

[26] F. L. Pedrotti and L. S. Pedrotti. *Introduction to Optics*. Englewood Cliffs, ed. (Prentice-Hall International, Inc.), New Jersey (1987).

[27] M. Dantus, and V. V. Lozovoy. Experimental Coherent Laser Control of Physicochemical Processes. *Chem. Rev. A* **104**, 1813–1859 (2004).

[28] A. M. Weiner, J. P. Heritage, and E. M. Kirschner. High-resolution femtosecond pulse shaping. *J. Opt. Soc. Am. B* **5**(8), 1563–1572 (1988).

[29] O. Lehmann. Über fliessende Krystalle. *Z. Phys. Chem.* **4**, 462–472 (1889).

[30] CRI, Cambridge Research & Instrumentation, Inc. *Spatial Light Modulator (SLM) System*. User's Manual (2003).

[31] M. M. Wefers and K. A. Nelson. Analysis of programmable ultrashort waveform generation using liquid-crystal spatial light modulators. *J. Opt. Soc. Am. B* **12**(7), 1343–1362 (1995).

[32] H. Nyquist. Certain topics in telegraph transmission theory. *Proc. IEEE, Reprint* **90**(2), 280–305 (2002).

[33] H. Haken and H. C. Wolf. *Atom- und Quantenphysik*. Springer, Berlin, Heidelberg, New York (2004).

[34] L. D. Landau and E. M. Lifschitz. *Quantenmechanik*. Akademie-Verlag, Berlin (1971).

[35] D. J. Tannor. *The Interaction of Light with Matter: A Coherent Perspective*. in Encyclopedia of Chemical Physics and Physical Chemistry, J. H. Moore and N. D. Spencer, ed., Philadelphia (2001).

[36] H. Haken and H. C. Wolf. *Molekülphysik und Quantenchemie*. Springer, Berlin, Heidelberg, New York (2003).

[37] C. Meier and V. Engel. *Pump-Probe Ionization Spectroscopy of a Diatomic Molecule: The Sodium Dimer as a Prototype Example*, 369–394. in Femtosecond Chemistry, J. Manz and L. Wöste, ed. (VCH Verlagsgesellschaft), Weinheim (1995).

[38] M. J. Rosker, M. Dantus, and A. H. Zewail. Femtosecond real-time probing of reactions: I. The technique. *J. Chem. Phys.* **89**(10), 6113–6127 (1988).

[39] J. H. Glownia, R. E. Walkup, D. R. Gnass, M. Kaschke, J. A. Misewich, and P. P. Sorokin. *Femtosecond Braodband Absorption Spectroscopy of Fragments Formed in the Photodissociation of Gas-Phase Molecules*, 131–166. in Femtosecond Chemistry, J. Manz and L. Wöste, ed. (VCH Verlagsgesellschaft), Weinheim (1995).

[40] M. Dantus, M. H. M. Janssen, and A. H. Zewail. Femtosecond probing of molecular dynamics by mass-spectrometry in a molecular beam. *Chem. Phys. Lett.* **181**(4), 281–287 (1991).

[41] E. Schreiber. *Femtosecond Real-Time Spectroscopy of Small Molecules and Clusters*. Springer Verlag, Berlin (1998).

[42] L. Wöste. Laser Spectroscopy of Metal Clusters. *Z. Phys. Chemie* **196**, 1–41 (1996).

[43] S. Rutz. *Femtosekundenspektroskopie zur Wellenpaketdynamik in Alkalidimeren und -trimeren*. Dissertation, Freie Universität Berlin (1996).

[44] A. P. Peirce, M. A. Dahleh, and H. Rabitz. Optimal control of quantum-mechanical systems: Existence, numerical approximation, and applications. *Phys. Rev. A* **37**(12), 4950–4964 (1988).

[45] S. Shi, A. Woody, and H. Rabitz. Optimal control of selective vibrational excitation in harmonic linear chain molecules. *J. Chem. Phys.* **88**(11), 6870–6883 (1988).

[46] R. Kosloff, S. A. Rice, R. Gaspard, S. Tersigni, and D. J. Tannor. Wavepacket Dancing: Achieving Chemical Selectivity by Shaping Light Pulses. *Chem. Phys.* **139**, 201–220 (1989).

[47] H. Rabitz and W. Zhu. Optimal Control of Molecular Motion: Design, Implementation, and Inversion. *Acc. Chem. Res.* **33**(8), 572–578 (2000).

[48] W. Jakubetz, J. Manz, and H.-J. Schreier. Theory of Optimal Laser Pulses for Selective Transitions Between Molecular Eigenstates. *Chem. Phys. Lett.* **165**(1), 100–106 (1990).

[49] J. Manz. *Molecular Wavepacket Dynamics: Theory for Experiments 1926-1996*, 80–318. in Femtochemistry and Femtobiology: Ultrafast Reaction Dynamics at Atomic-Scale Resolution, Nobel Symposium 101, V. Sundström, ed. (Imperial College Press), London (1996).

[50] R. S. Judson and H. Rabitz. Teaching Lasers to Control Molecules. *Phys. Rev. Lett.* **68**(10), 1500–1503 (1992).

[51] A. Assion, T. Baumert, M. Bergt, T. Brixner, B. Kiefer, V. Seyfried, M. Strehle, and G. Gerber. Control of Chemical Reactions by Feedback-Optimized Phase-Shaped Femtosecond Laser Pulses. *Science* **282**, 919–922 (1998).

[52] C. J. Bardeen, V. V. Yakovlev, K. R. Wilson, S. D. Carpenter, P. M. Weber, and W. S. Warren. Feedback quantum control of molecular electronic population transfer. *Chem. Phys. Lett.* **280**(1-2), 151–158 (1997).

[53] Š. Vajda, A. Bartelt, E.-C. Kaposta, T. Leisner, C. Lupulescu, S. Minemoto, P. Rosendo-Francisco, and L. Wöste. Feedback optimization of shaped femtosecond laser pulses for controlling the wavepacket dynamics and reactivity of mixed alkaline clusters. *Chem. Phys.* **267**(1-3), 231–239 (2001).

[54] J. Chesnoy and A. Mokhtari. Resonant impulsive-stimulated Raman scattering on malachite green. *Phys. Rev. A* **38**(7), 3566–3576 (1988).

[55] R. Bartels, S. Backus, E. Zeek, L. Misoguti, G. Vdovin, I. P. Christov, M. M. Murnane, and H. C. Kapteyn. Shaped-pulse optimization of coherent emission of high-harmonic soft X-rays. *Nature* **406**, 164–166 (2000).

[56] I. Rechenberg. *Evolutionsstrategie*. Friedrich Frommann Verlag, Stuttgart (1973).

[57] H. Schwefel. *Numerische Optimierung von Computer-Modellen mittels Evolutionsstrategien*. Birkäuser Verlag, Basel/Stuttgart (1977).

[58] H. Kühling. *Ultrakurzzeit-Spektroskopie an kleinen Alkaliclustern*. Dissertation, Freie Universität Berlin (1993).

[59] N. F. Ramsey. *Molecular Beams*. R. J. Elliott, J. A. Krumhansl, W. Marshall, and D. H. Wilkinson, ed. (Oxford University Press), Oxford (1956).

[60] Spectra Physics. Operator's Manual; Millennia X. *Coherent Laser Group* (2001).

[61] B. Lyot. Optical apparatus with wide field using interference of polarized light. *C. R. Acad. Sci. (Paris)* **197**, 1593 (1933).

[62] Spectra Physics. Operator's Manual; Ti:Sapphire Oscillator. *Coherent Laser Group* (1994).

[63] Cambridge Research & Instrumentation, Inc. SLM-256 Spatial Light Modulator. .

[64] A. Lindinger, C. Lupulescu, F. Vetter, M. Plewicki, S. M. Weber, A. Merli, and L. Wöste. Learning from the acquired optimized pulse shapes about the isotope selective ionization of potassium dimers. *J. Chem. Phys.* **122**, 024312 (2005).

[65] S. Magnier and Ph. Millié. Potential curves for the ground and numerous highly excited electronic states of K_2 and NaK. *Phys. Rev. A* **54**(1), 204–218 (1996).

[66] H. Katô, M. Sakano, N. Yoshie, M. Baba, and K. Ishikawa. High resolution laser spectroscopy of the $B^1\Pi - X^1\Sigma^+$ transition of $^{23}Na^{39}K$, and the pertubation between the $B^1\Pi$ and $c^3\Sigma^+$ states. *J. Chem. Phys.* **93**(4), 2228–2237 (1990).

[67] B. Schäfer-Bung, R. Mitrić, and V. Bonačić-Koutecký, A. Bartelt, C. Lupulescu, A. Lindinger, Š. Vajda, S. M. Weber, and L. Wöste. Optimal Control of Ionization Processes in NaK: Comparison between Theory and Experiment. *J. Phys. Chem. A* **108**(19), 4175–4179 (2004).

[68] A. Pashov, I. Jackowska, W. Jastrzębski, and P. Kowalczyk. Polarization labeling spectroscopy of the $3^1\Pi$ and $6^1\Sigma^+$ states in NaK. *Phys. Rev. A* **58**(2), 1048–1054 (1998).

[69] H. Ikoma, S. Kasahara, and H. Katô. Pertubations, intensity anomalies, and line broadening of $^{23}Na^{39}K$ studied by optical-optical double resonance polarization spectroscopy. *Mol. Phys.* **85**(4), 799–820 (1995).

[70] S. Kasahara, H. Ikoma, and H. Katô. Optical-optical double resonance polarization spectroscopy of highly excited states of $^{23}Na^{39}K$. *J. Chem. Phys.* **100**(1), 63–69 (1994).

[71] I. Sh. Averbukh and N. F. Perelman. Fractional Revivals: Universality in the Long-Term Evolution of Quantum Wave Packets Beyond the Correspondence Principle Dynamics. *Phys. Lett. A* **139**(9), 449–453 (1989).

[72] L.-E. Berg, M. Beutter, T. Hansson. Femtosecond laser spectroscopy on the vibrational wave packet dynamics of the $A^1\Sigma^+$ state of NaK. *Chem. Phys. Lett.* **253**, 327–332 (1996).

[73] L. M. Andersson, H. O. Karlsson, O. Goscinski, L.-E. Berg, M. Beutter, T. Hansson. Vibrational wave packet dynamics in NaK: The $A^1\Sigma^+$ state. *Chem. Phys.* **241**, 43–54 (1999).

[74] A. Lindinger, F. Vetter, C. Lupulescu, M. Plewicki, S. M. Weber, A. Merli, and L. Wöste. Selective ionization via different electronic pathways by optimal control demonstrated for $^{23}Na^{39}K/^{23}Na^{41}K$. *Chem. Phys. Lett.* **397**, 123–127 (2004).

[75] A. Lindinger, C. Lupulescu, M. Plewicki, F. Vetter, A. Merli, S. M. Weber, and L. Wöste. Isotope Selective Ionization by Optimal Control Using Shaped Femtosecond Laser Pulses. *Phys. Rev. Lett.* **93**(3), 033001–1 – 033001–4 (2004).

[76] C. Lupulescu. *Femtosecond Analysis and Feedback Control of Molecular Processes in Organometallic and Alkaline Systems.* Dissertation, Freie Universität Berlin (2004).

[77] F. Vetter, M. Plewicki, A. Lindinger, A. Merli, S. M. Weber, and L. Wöste. Optimized isotope-selective ionization of $^{23}Na^{39}K$ and $^{23}Na^{41}K$ by applying evolutionary strategies. *Phys. Chem. Chem. Phys.* **7**, 1151–1156 (2005).

[78] B. Schäfer-Bung, V. Bonačić-Koutecký, F. Sauer, S. M. Weber, L. Wöste, and A. Lindinger. Isotope selective photoionization of NaK by optimal control: Theory and experiment. *J. Chem. Phys.* **125**(1), 214310–1 – 214310–8 (2006).

[79] V. F. Krotov. *Contr. Cybernet* **17**, 115 (1988).

[80] Y. Lee, C. Yun, Y. Yoon, T. Kim, and B. Kim. The 530 nm system of KRb observed in a pulsed molecular beam: New electric quadrupole transitions ($1^1\Delta$ - $X^1\Sigma^+$). *J. Chem. Physics* **115**(16), 7413–7419 (2001).

[81] Operator's Manual; Verdi^{TM} V-2/V-5/V-6; Diode-Pumped Lasers. *Coherent Laser Group* .

[82] Cambridge Research & Instrumentation, Inc. Spatial Light Modulator (SLM) System; User's Manual. (2003).

[83] S. J. Park, Y. J. Choi, Y. S. Lee, and G.-H. Jeung. Ab initio calculations of the electronic states of KRb. *Chem. Phys.* **257**, 135–145 (2000).

[84] F. Sauer, A. Merli, L. Wöste, and A. Lindinger. High Resolution Coherent Control Measurements on KRb. *Chem. Phys.* **334**(1-3), 138–143 (2007).

[85] T. W. Hänsch and A. L. Schawlow. Cooling of Gases by Laser Radiation. *Opt. Comm.* **13**(1), 68–69 (1975).

[86] W. Salzmann, U. Poschinger, R. Wester, M. Weidemüller, A. Merli, S. M. Weber, F. Sauer, M. Plewicki, F. Weise, A. Mirabal Esparza, L. Wöste, and A. Lindinger. Coherent control with shaped femtosecond laser pulses applied to ultracold molecules. *Phys. Rev. A* **73**, 023414–1 – 023414–5 (2006).

[87] V. S. Letokov, V. P. Chebotayev, ed. *Nonlinear Laser Spectroscopy.* Springer Verlag, Berlin, Heidelberg, New York (1977).

[88] K. F. Freed and A. Nitzan. Intramolecular vibrational energy redistribution and the time evolution of molecular fluorescence. *J. Chem. Phys.* **73**(10), 4765–4778 (1980).

[89] A. Charvat, J. Aßmann, B. Abel, D. Schwarzer, K. Henning, K. Luther, and J. Troe. Direct observation of intramolecular vibrational energy redistribution of selectively excited CH_2I_2 and C_3H_5I molecules in solution. *Phys. Chem. Chem. Phys.* **3**, 2230–2240 (2001).

[90] H. J. Matcalf, P. van der Straten. *Laser Cooling and Trapping.* Springer Verlag, New York (1999).

[91] W. D. Phillips. Nobel Lecture: Laser cooling and trapping of neutral atoms. *Rev. Mod. Phys.* **70**(3), 721–741 (1998).

[92] M. Kemmann. *Laserinduzierte und spontane Molekülbildung in einer magneto-optischen Atomfalle.* Diplomarbeit, Albert-Ludwigs-Universität, Freiburg (2001).

[93] W. Ketterle, K. B. Davis, M. A. Joffe, A. Martin, and D. E. Pritchard. High Densities of Cold Atoms in a *Dark* Spontaneous-Force Optical Trap. *Phys. Rev. Lett.* **70**(15), 2253–2256 (1993).

[94] C. G. Townsend, N. H. Edwards, K. P. Zetie, C. J. Cooper, J. Rink, and C. J. Foot. High-density trapping of cesium atoms in a dark magneto-optical trap. *Phys. Rev. A* **53**(3), 1702–1714 (1996).

[95] J. Y. Kim and D. Cho. Dark-Spot Magneto-Optical Trap of Cesium Atoms. *J. Korean Phys. Soc.* **39**(5), 864–868 (2001).

[96] K.-A. Suominen. Theories for cold atomic collisions in light fields. *J. Phys. B* **29**(24), 5981–6007 (1996).

[97] J. Weiner, V. S. Bagnato, S. Zilio, and P. S. Julienne. Experiments and theory in cold and ultracold collisions. *Rev. Mod. Phys.* **71**(1), 1–85 (1999).

[98] J. Weiner. *Advances in Ultracold Collisions: Experimentation and Theory*, 45–78. in Volume 35 of *Advances in Atomic, Molecular and Optical Physics*; Academic, Boston (1995).

[99] G. Meijer. Cold Molecules. *Chem. Phys. Chem.* **3**(6), 495–501 (2002).

[100] J. M. Doyle, B. Friedrich, J. Kim, and D. Patterson. Buffer-gas loading of atoms and molecules into a magnetic trap. *Phys. Rev. A; Rapid Comm.* **52**(4), R2515–R2518 (1995).

[101] J. Herbig, T. Kraemer, M. Mark, T. Weber, C. Chin, H.-C. Nägerl, and R. Grimm. Preparation of a Pure Molecular Quantum Gas. *Science* **301**, 1510 (2003).

[102] H. R. Thorsheim, J. Weiner, and P. S. Julienne. Laser-Induced Photoassociation of Ultracold Sodium Atoms. *Phys. Rev. Lett.* **58**(23), 2420–2423 (1987).

[103] P. D. Lett, K. Helmerson, W. D. Phillips, L. P. Ratcliff, S. L. Rolston, and W. E. Wagshul. Spectroscopy of Na_2 by Photoassociation of Laser-Cooled Na. *Phys. Rev. Lett.* **71**(14), 2200–2203 (1993).

[104] A. Fioretti, D. Comparat, A. Crubellier, O. Dulieu, F. Masnou-Seeuws, and P. Pillet. Formation of Cold Cs_2 Molecules through Photoassociation. *Phys. Rev. Lett.* **80**(2), 4402–4405 (1998).

[105] C. Gabbanini, A. Fioretti, A. Lucchesini, S. Grozzini, and M. Mazzoni. Cold Rubidium Molecules Formed in a Magneto-Optical Trap. *Phys. Rev. Lett.* **84**(13), 2814–1817 (2000).

[106] C. Koch, R. Kosloff, and F. Masnou-Seeuws. Short-pulse photoassociation in rubidium below the D_1 line. *Phys. Rev. A* **73**, 043409 – 03409–14 (2006).

[107] B. Schäfer-Bung, R. Mitric, and V. Bonačić-Koutecký. Photostabilization of the ultracold Rb_2 molecule by optimal control. *J. Phys. B* **39**(doi: 10.1088/0953-4075/39/19/S16) (2006).

[108] K. P. Huber and G. Herzberg. *Molecular Spectra and Molecular Structure: IV. Constants of Diatomic Molecules.* Van Nostrand Reinhold Company, New York (1979).

[109] J. D. Miller, R. A. Cline, and D. J. Heinzen. Photoassociation Spectrum of Ultracold Rb Atoms. *Phys. Rev. Lett.* **71**(14), 2204–2207 (1993).

[110] W. Salzmann. *in Vorbereitung.* Dissertation, Universität Freiburg (2007).

[111] F. Weise. *Entwicklung der Pulsformung in Phase, Amplitude und Polarisation sowie kohärente Kontrolle in der MOT.* Diplomarbeit, Freie Universität Berlin (2006).

[112] M. Bellini and T. W. Hänsch. Phase-locked white-light continuum pulses: toward a universal optical frequency-comb synthesizer. *Opt. Lett.* **25**(14), 1049–1051 (2000).

[113] A. Brodeur and S. L. Chin. Ultrafast white-light continuum generation and self-focusing in transparent condensed media. *J. Opt. Soc. Am. B* **16**(4), 637–650 (1999).

[114] M. Plewicki. *Phase, amplitude and polarization pulse shaping in order to influence molecular processes.* Dissertation, Freie Universität Berlin (2007).

[115] T. Wilhelm, J. Piel, and E. Riedle. Sub-20 fs pulses tunable across the visible from a blue-pumped single-pass noncollinear parametric converter. *Opt. Lett.* **22**(19), 1494–1496 (1997).

[116] J. Piel, E. Riedle, L. Gundlach, R. Ernstorfer, and R. Eichberger. Sub-20 fs visible pulses with 750 nJ energy from a 100 kHz noncollinear optical parametric amplifier. *Opt. Lett.* **31**(9), 1289–1291 (2006).

[117] C. Koch. Persönliche Mitteilung. (2007).

[118] A. Crubellier, O. Dulieu, F. Masnou-Seeuws, M. Elbs, H. Knöckel, and E. Tiemann. Simple determination of Na_2 scattering lengths using observed bound levels at the ground state asymptote. *Eur. Phys. J. D* **6**, 211–220 (1999).